**Combination**

**1)** Two reactions that burn brightly were shown to a class.

In **Reaction 1**, the teacher demonstrated a strip of magnesium ribbon reacting with oxygen in air.

In **Reaction 2**, which was shown on a video, a grey powder, zinc, was mixed with yellow sulfur powder. The mixture was poured into a pile and heated. The mixed powders burst into flame and made a white powder.

Analyse these reactions by answering the following questions.

(a) Identify the type of reaction occurring, and state the condition that both reactions require for each to occur.

(b) **Reaction 1:** Magnesium metal reacting with oxygen gas in air.

(i) Describe the observations that would be made for this reaction.

(ii) Link these observations to the reactants and products involved in this reaction.

**Reaction 2:** Zinc metal reacting with sulfur.

(iii) Name the product formed when powdered sulfur reacts with powdered zinc metal.

(iv) Link the observations for this reaction, as given above, to the reactants and products involved.

(c) Explain the two reactions (magnesium ribbon with oxygen gas, and zinc powder with sulfur powder) in terms of electron transfer.

Write a balanced symbol equation for each reaction.

**2)** A teacher showed her class two video clips of chemical reactions.

One was of a reaction between sodium metal and chlorine gas. The second was of a reaction between solid sulfur and chlorine gas.

(a) When the sodium metal reacted with chlorine gas, the video clip showed a

shiny grey solid reacting with a yellow-green gas. The reaction resulted in the

formation of white crystals. Link these observations to the reactants and

products involved in this reaction.

(i) Name the product that will be formed when solid sulfur reacts with chlorine gas.

(ii) Identify the type of reaction that is occurring, and give a reason for your choice.

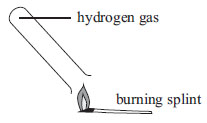
(b) (i) Write a balanced symbol equation for the reaction between sodium and chlorine.

(ii) Write a balanced symbol equation for the reaction between sulfur and chlorine.

(c) Explain the differences in the two reactions: sodium with chlorine gas and sulfur with chlorine gas, in terms of electron transfer.

**3)** Two reactions are carried out in the laboratory.

In **Reaction 1**, a teacher demonstrates a reaction between hydrogen gas and oxygen in the air.



(i) Identify the type of reaction that occurs: Give a reason for your choice:

(ii) Describe any observations that would be made of this reaction, and link these

to the substances involved in the reaction.

Outline a test that could be used to confirm the presence of the product formed.

(iii) Write a balanced symbol equation for this reaction.

**4)** Different elements can be reacted together to form compounds with properties that are different to the original elements. The reaction of iron and sulfur to form iron(II) sulfide is an example of a combination reaction where all species (reactants and products) have different properties. Give a detailed account of this combination reaction. In your answer you should:

 state the conditions required for this reaction to occur

 describe any observations that would be made

 outline the physical and chemical properties of EACH of the species

 explain why the properties of the reactants differ from those of the products

 write a balanced symbol equation for the reaction.

5**)** Chemical compounds are made by combining elements. For example, magnesium oxide is made by combining magnesium and oxygen, and carbon dioxide is made by combining carbon and oxygen. Compare and contrast the combination reaction that produces magnesium oxide with the combination reaction that produces carbon dioxide. In your answer, you should:

state the conditions required for EACH combination reaction to occur

describe what would be observed in EACH combination reaction

write a balanced symbol equation for EACH combination reaction

discuss the similarities and differences between the TWO combination reactions.

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